FOREIGN TECHNOLOGY DIVISION

SOCIALISM, THE SCIENTIFIC-TECHNICAL REVOLUTION AND LONG-TERM FORECASTING

by

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Block	Italic	Transliteration
А а	*А а*	A, a
Б б	*Б б*	B, b
В в	*В в*	V, v
Г г	*Г г*	G, g
Д д	*Д д*	D, d
Е е	*Е е*	Ye, ye; E, e*
Ж ж	*Ж ж*	Zh, zh
З з	*З з*	Z, z
И и	*И и*	I, i
Й й	*Й й*	Y, y
К к	*К к*	K, k
Л л	*Л л*	L, l
М м	*М м*	M, m
Н н	*Н н*	N, n
О о	*О о*	O, o
П п	*П п*	P, p
Р р	*Р р*	R, r
С с	*С с*	S, s
Т т	*Т т*	T, t
У у	*У у*	U, u
Ф ф	*Ф ф*	F, f
Х х	*Х х*	Kh, kh
Ц ц	*Ц ц*	Ts, ts
Ч ч	*Ч ч*	Ch, ch
Ш ш	*Ш ш*	Sh, sh
Щ щ	*Щ щ*	Shch, shch
Ъ ъ	*Ъ ъ*	"
Ы ы	*Ы ы*	Y, y
Ь ь	*Ь ь*	'
Э э	*Э э*	E, e
Ю ю	*Ю ю*	Yu, yu
Я я	*Я я*	Ya, ya

* ye initially, after vowels, and after ъ, ь; e elsewhere. When written as ё in Russian, transliterate as yё or ё. The use of diacritical marks is preferred, but such marks may be omitted when expediency dictates.

SOCIALISM, THE SCIENTIFIC-TECHNICAL REVOLUTION AND LONG-TERM FORECASTING

A. D. Smirnov

Humanity always sought to form an idea about its future, however these tendencies were realized in utopian, unscientific form. Only the materialist understanding of history, a scientific interpretation of public development as a natural historic process allowed K. Marx, F. Engels, and V. I. Lenin to give a scientific foresight of processes of decomposition of the capitalist system, the maturation of the socialist revolution, the unavoidable victory of socialism and communism. These forecasts, which served as the basis of revolutionary Communist ideology, leaned on the scientific analysis of the laws of development of the capitalist method of production and, preceding it, public-economic formations, they leaned on an analysis of actual marxist general sociological correlations and specific economic laws of development of capitalist production.

The practical realization of marxist foresight of the future is a historical demonstration of the capabilities of scientific

foresight not only of the nearest consequences of each given stage of social development, but also its more or less distant results. In this case marxism completely takes account of the specific properties of social-historical development, which qualitatively is distinguished from the development of nature, on which is based the distinction of sociological foresight from naturalistic forecast. The historical process of development of society is inseparable from human activity, building productive forces, public relations, culture, fighting for its interests. Historical necessity does not exist outside society, irrespective of the interests of people: it expresses the interests of one component of society and contradicts the interests of another component, other classes. This means that realization of historical necessity depends on the social activity of interested classes, but its objectivity is involved not in that it is irrelative to class interests, but in that it is caused by the preceding development of material life of society. New conditions of forming of the material life of society which appear in connection with the initiated scientific-technical revolution, with a progressing acceleration of rates of development of science and technology, with a series of basic transformations of production, make this vital historical connection increasingly more complex and control of social-economic processes an increasingly more responsible social action, the efficiency of which to a continuously increasing degree depends on foresight of future states of productive forces of society.

The necessity of such foresight is evident, however its capabilities, as we know, are far from equal in society standing at different stages of historical development. The methodological

basis of scientific sociological foresight is dialectical and historical materialism, the philosophy of marxism. The mastery of dialectical-materialist methods of foresight of social-economic processes is a guarantee of rapid forward movement of socialist society, the successful development of the scientific-technical revolution and construction of the material-technical base of Communist society.

Methodology, Procedures and Conditions of Forecasting

Acknowledgement of historical materialism as the methodological basis of social-economic foresight poses a problem about the means of using the dialectical method during solution of concrete problems of forecasting. On the whole the problem of social-economic foresight, which involves a joint description of the future process of public evolution, is a nonformalized problem. Therefore the dialectical method developed for the solution of a class of non-formalized problems is the basic method of scientific forecasting. Its concrete realization, apparently, can proceed with the framework of a system analysis of complex problems, the conceptual apparatus of which, roughly speaking, is a "procedure" of the application of dialectics.

The problem of long-term forecasting of the development of socialist society, specifically the economics of the country, can be carried out only on the basis of a complex system analysis of the entire combination of political, social, defense, economic and scientific-cultural factors which govern the perspective of development

of the country. Problems of development of the economics of the country to a lasting continuance of historical time is impossible to solve without taking into account the evolution of the international situation and social-economic structure of the country, the change in which proves to be a direct influence on utilization of resources of economic growth. A systems analysis of the complex problem of long-term forecasting of the evolution of socialist society should have as its result the creation of a legitimate multitude of scientifically based strategies of economic-political development of the country, calculated for a lasting perspective, isolation of the inconvertible connections of a causal-effect character from the entire combination of phenomena of natural-historical development.

Realization of processes of social-economic developmert today proceeds under conditions of intense scientific-technical advancement, of the perfecting of the technology of public production, structural shifts in society and specific demographic progress. A combination of all these conditions forms a system of social and technological (in the broad sense) limitations which transform the problem of finding the optimum trajectory of social-economic development into a problem which can be solved depending on the basic premises lying at the root of qualitative social-economic analysis of conditions and goals of the process of socialist reproduction. In any of its forms this problem is, in essence, the problem of management, i.e., single-minded control of social-economic development, unavoidably connected with a change in past and present connections, rates and proportions of the process of

public reproduction. Therefore the methods of optimum management evolved within the framework of systems analysis, are the basic equipment of instruments of analysis of regularities of socialist reproduction and transformation into trends desired by society. It is obvious that during formulation of criteria of optimality are taken account of possible achievements of scientific-technical progress. Within the framework of this problem, of enormous theoretical and practical value is an omnidirectional analysis of conditions of reproduction in the past and present and extrapolation on the basis of this analysis of the basic trends of future development of the social-economic system. It is natural to define such an approach as a composition of forecast of development of the process of reproduction into the future, the duration of which can be fixed.

Let us, however, raise a question: why is it necessary to develop such methods of social-economic forecasting? Why is it insufficient or inexpedient to incorporate these or other formed or unfolding methods of planning, in particular optimum planning, for solution of a defined class of problems of development? It is obvious that only by answering these questions is it possible resonably to define long-term forecasting and its connection, its coupling with optimum planning and control of a social-economic system. Conducting of a clear watershed between the contents of the concept of "forecasting" and "optimum control" (planning) is necessary, inasmuch as otherwise there exists a logical alternative negation of either forecasting or optimum planning.

The need for long-term forecasting involves the fact that acceptance of economic-political solutions has a telling effect during a long period of time in the future, during which the process of production incorporates resources created in the past and the present. At the contemporary stage of economic development it is already insufficient to investigate periods of time not exceeding 5-7 years in duration. If the investment cycle is approximately equal to this period, then the return from invested funds takes the whole period of their functioning, which naturally considerably exceeds such a date; the duration of a number of natural processes utilized in an economic turnover encompasses decades and more. This all indicates the fact that efficiency of execution of systematic assignments essentially depends on how accurately it takes into account the action of all factors in the process of reproduction.

Furthermore, depending on development of material factors economic and social structures of society develop which prove to have a reverse influence on the industrial process. Systems analysis of these factors for the past and present allows revealing their mutual coordination (or measure of disagreement), which is the basis for judgement about future development of the system.

Consequently, creation of methods of economic forecasting is dictated first of all by the necessity of detection and of estimation of possible future effect from the acceptance of social-economic solutions in the present and past, inasmuch as a "given" time

continuously moves into the future. For this very reason methods of economic forecasting are based on formal (statistical) and nonformal treatment of basic trends of development of the people's economy in the past and present.

The basic stress of the use of methods of forecasting is placed on long-term forecasting, i.e., complete analysis of the economic development of society in the future and foresight of its individual aspects. This to a considerable extent governs the specific apparatus of analysis within the framework of economic forecasting, namely, estimation (by statistical methods) of the most hopeful trends of future development of the social-economic system. Since reliability in determination of parameters of public development in the distant future is not very great, utilization of methods of optimum control in this instance is hardly valid. Because of great "allowances" in appraisal of parameters the finding of "optimum solutions" under such conditions to a considerable extent is ephemeral, and consequently, it is inadvisable. Therefore, specifically, for goals of forecasting special methods are incorporated, which are based on explicit analysis of the criterion of quality of social-economic system.

The correlation of methods of prediction and optimum control (planning) is governed by the fact that among all possible (i.e., in the statistical or nonformal sense the best forecasted) variants of future development the criterion of quality of the social-economic system is determined, in other words, optimality of economics, in accordance with which the most desirable variant of development is

selected. In this sense the problem of forecasting and of optimum planning "merge," and in this case the decisive significance attaches to optimum planning, which allows not only selecting the best trajectory of development of economics, but also changing undesirable trends of development of the people's economy which were revealed in the past.

Parameters of future development can be determined on condition that basic trends of the past period will be kept in the predicted future. Therefore the hypothesis on which is based the utilization of methods of social-economic forecasting is similarity of global conditions of public reproduction in the past, present and predicted future, which with necessity emanates from uniform development of social-economic and scientific-technical advancement This is a reflection of that universal character of the fact that knowledge of the future is possible to the degree that the past and present of the examined process is known. Consequently, trends revealed in the past and present which are subject to forecasting and extrapolation should reflect the most important, the most essential features in development of the social-economic system. The structural approach to solution of the given problem includes the prerequisite about a uniform nonspontaneous development of the scientific-technical advancement in the past, present and future.

This means that in principle it is possible to foresee the future consequences of discoveries made in the past and present, on condition that pronounced technological shifts in the development of economics do not occur (including new discoveries and their

industrial utilization) which would wholly change our presentations about the course of development of the social system in the future. If, however, some scientific discovery of a fundamental character is perfected (for example, industrial utilization of thermonuclear fusion), then this, in essence, would mean that everything planned must be drastically re-examined in accordance with the new ideas.

The natural development of these principles leads to a view of the social-economic system as a complex, hierarchically organized system characterized by a definite degree of inertness. The concept of inertness in this case implies the impossibility of arbitrarily, at one's pleasure and in a short period of time, of changing the technological and social-economic structure of society. In other words, the revealed trends in development which are characteristic for a past and present continue to act and gradually evolve in the future.

True, here it should be specified that theoretically one can assume, for example, that the basic structural technological parameters can be comparatively rapidly changed. But such a variation of structural parameters will unavoidably require completely undesirable high expenses which, in essence, is equivalent to the practical impossibility of rapidly changing the structural parameters in a comparatively limited period of time.

Further, it is necessary to indicate the relativity of the concept of inertness of the social-economic system in "space and time." Within the framework of long-term forecasting the people's

economy of the country is examined as a system which is organized as a complex form, as a system which possesses different stages of hierarchy, states of joint subordination. Therefore it is not correct to think that all elements of economics are inertial to the same degree. The greatest inertness is found in parameters which characterize the macrostructure of the system, for example, utilization in the people's economy of basic material, the relation between national income and gross product, distribution of national income to the fund of consumption and accumulation, etc. A lesser degree of inertness is found, for example, in those processes which occur at a level of branches, enterprises, separate sections of production.

Introduction into production of new discoveries, for example, oxygen blowing in metallurgy, sharply changed the technological proportions within the limits of individual enterprises, but to a lesser extent influenced production of metal on the whole and in practice influenced the kinetics of the norm of consumption of metal in the people's economy on the whole. This example visually illustrated the "spatial" relativity of the concept of inertness of economics in the sense that changes in technological processes at lower stages of the hierarchy exert progressively less influence on structural parameters of higher levels of the hierarchy of the people's economy. Consequently, forecasting in terms of past and present trends with the necessary corrections is reliable to the extent of investigation of the inertness of the appropriate block.

On the other hand, the more lasting the period of forecasting, the greater is the possibility for a change in trends of the

social-economic development which proceeds under the influence of different factors. Therefore a forecast of the distant future is fallible because of the strong influence of the factor of chance or, which in this case is the same, the low inertness of economics in the future with respect to the present, the objective increase in possibilities for a change in the social-economic structure of society in the desired direction. However this "advantage" of long period should be used with caution, since if their structural parameters are "badly" predicted, then, naturally, results of single-minded control in the sense of their correctness and scientific validity will not be very high.

Predicition and the Selection of Social-Economic Solutions

Apparently, the basic problem solved by long-term forecasting, within the framework of the general problem of social-economic predicition, is estimation of the level of development in the future which would occur if basic trends governed to the extent of their inertness at different stages of hierarchy which we observed in the past and present, were basically preserved.

Let us emphasize again that we are speaking only about perpetuation of trends of development, by no means about invariability of the temp and proportions of reproduction for the past. Let us note another important aspect; such a formulation of the problem by no means suggests "subordination" of acceptance of solutions to results of forecasting.

In this connection, economic forecasting can be given this sense: we want to know what would happen if basic global trends of the process of reproduction would remain invariables. But inasmuch as not all trends of development of the people's economy in the past and present are desirable from the point of view of the future, inasmuch as not every optimum (in the probable sense) forecast of the future is optimum as well in the social-economic sense. On the basis of an account and weighing of past and present trends, the social-economic forecasting should give a "fan" of possible variants of development of the public system in the future, among which socialist society, following specific criteria of otpimality, selects the best variant. The best variant in this sense is the forecast variant, while the reverse is not true.

However, one should note that, when forming an optimum plan, society follows more general considerations than those which properly lie at the basis of economic forecasting. Therefore the realistic situation is that in which the forecasted variant (or a combination of variants of different trends) will enter the optimum plan not wholly, but partially, primarily as a basis for parameterization of the optimum system of long-range functioning of the people's economy. In essence, results of long-term forecasting are a starting point on the basis of which is formed the multistage optimum system itself of the process of socialist reproduction.

From this viewpoint economic forecasting occupies an important place in the total system of social-economic development, inasmuch as it allows one to evaluate the advantages of optimum building of

the people's economy at one or another process of development. This is possible only to the degree that one knows the stage of development of the people's economy if optimum development did not occur, if trends in evolution of economic structure remained invariable in comparison with the past.

Stages of Economic Forecasting

The process itself of conducting economic forecasting can be analytically presented in the form of the following stages:

1) social-economic analysis of the "prehistory" of the process;

2) selection of an adequate hypothesis of smoothing and forecasting;

3) a quantitative analysis and correlation of obtained results of forecasting.

In accordance with this during the first stage the dependability of basic economic intelligence is estimated, basic economic phenomena are analyzed, which occurred in the period being investigated, qualitatively the structural changes and their causes are determined. On the basis of such an analysis a mathematical-statistical model is selected which will serve as the basic theoretical instrument of quantitative analysis of economic processes. Let us note that the measure of adequacy of the selected model, in other words, the

measure of adequate of forecasting to realistic trends is determined qualitatively, i.e., it wholly depends on the depth and validity of the economic analysis of real processes. Therefore it is understandable that the dependability of forecasted results, apart from formal criteria, to a great degree is determined by analyses of the first stage.

At the third stage methods of calculation are determined, for example, regression analysis and exponential smoothing, etc. As a rule, it is advisable to take different methods of calculation and compare within the limits of one and the same model the obtained results. After economic analysis and smoothing of basic statistical indices according to selected hypotheses of smoothing and forecasting in accordance with a definite criterion (usually the least mean square error of forecast) revealed tendencies ("trends") of the involved period are extrapolated. This stage is usually performed on computers according to assigned algorithms.

Along with determination of an adequate model of smoothing and extrapolation, one of the most complicated stages of economic forecasting is correlation of results of extrapolation at a higher level of the national-economic hierarchy with parameters obtained by means of collection of expert evaluations at subordinate levels. The first mismatch of results calculated by these methods can be considered a rule (really, coincidence of extrapolation of evaluations is a chance because of the difference in methods of reckoning). Therefore correlation of forecasting of parameters at different levels unavoidably involves an analysis of the system of authority

with which structural ingredients enter the aggregate. These analyses can be performed by mathematical and informal methods. The obtained results are analyzed and are estimated economically, at which point, actually, work with forecasting ends as the stage of preplanning calculation.

If new from the point of view of selected stages we look at the process of obtaining "expert" evaluations, it will consist of a stage of the analysis of the "prehistory" and actually appraisal of future parameters. All elements of mathematical-statistical analysis are absent in this process.

Substantiation of Probability Methods of Social-Economic Forecasting

In real conditions the process of public reproduction proceeds under the influence of numerous factors, the nature of which is diverse. Upon unification into a statistical assembly their antagonistic effects to a definite degree cancel each other out, however not completely. Consequently, it is necessary to consider, as it is said, the heterogeneity of the basic statistical aggregate. This heterogeneity entails errors in measurement and forecasting of social-economic phenomena. It is necessary to discriminate factors whose actions bear an orderly, regular character, as well as accidental factors. In reality the influence of these ensembles of factors proceeds simultaneously, so that to distinguish and identify the influence of each of them is practically impossible. However their combined influence can statistically be presented and

calculated as determinate and accidental components of functions which quantitatively describe the kinetics of economic processes.

From a certain viewpoint the presence of an element of chance in the process of functioning of the social-economic system is a reflection of the apparent fact that the future cannot be predicted absolutely accurately. It is sufficient in confirmation to appeal to the fact that as national-economic plans are realized they must unavoidably be corrected, inasmuch as it is impossible to foresee all processes which will occur in the future. An "ideal extrapolator," i.e., a cybernetic device which absolutely accurately forecasts the future, is physically unrealizable, it cannot in practice be incarnated in any scheme and physical (in the broadest sense) mechanism.

In this sense it is useful to compare a uniquely determinate and probability forecast of economic processes.

Uniquely determinate forecast is possible if a quantitative law which is controlling for reproduction is known, and systematic values or parameters of this process are also uniquely determinate, specifically which are orderly functions of time. In this way, an "accurate" forecast of economic processes reduces to determination of systematic, i.e., future parameters, whereupon the process itself becomes completely defined. As it is easy to see, in this way the economic process itself and the character of information about its kinetics are idealized. A uniquely determinate approach does not take account of the composite influence of many factors on

scales and growth of the social-economic system, as well as errors of measurement and processing of empirical information. Consequently, we have an "accurate" forecast of the process, the numerical realization of which (but is accurately known) will differ from forecasted values. Therefore utilization of a uniquely determinate calculation is validated only by a simple technology and by a lack, in most cases, of the necessary information.

More justified, in our view, is use for forecasting of equations of regression between different economic parameters in time. In this instance, for example, the method of least squares stands out, the tendency of an economic process at a given period which is extrapolated into the future. The probability of substantial errors with such an approach is explained by the fact that parameters of regression are optimum (they minimize mean-square error), namely, for a given number of observations they are changed with more or less new observations. Meanwhile for a simple extrapolation of revealed trend it is assumed that parameters of regression are invariant upon addition of new observations in the entire period of the forecast.

For long-term forecasting this method, obviously is impracticable generally, and for a short-term forecast it can give satisfactory results if parameters of regression are changed insignificantly (with correct selection of the hypothesis about the character of the equation of regression). Consequently, the role and value of a qualitative analysis in this instance consist of evaluating the situation in which these methods could be incorporated. Apparently,

for short-term forecasting utilization of simple regressions is justified in relationship to global large-scale economic structures, the variation of which is small in short intervals of time. In this instance because of the comparative simplicity of calculations and the obviousness, methods of regression along with uniquely determinate approaches are entirely justified in reference to analysis of the kinetics of the people's economy.

The basic advantage of forecasting of social-economic kinetics, examined as a stochastic process, is, in our view, less rigidity of requirements in relationship to correctness of presentations about the real passage of process. This, of course, does not reject a theoretical and practical analysis of social-economic processes examined as uniquely determinate processes. Simulation of an economic system, for example, with the aid of systems of usual finite-difference equations, is theoretically easy to generalize allowing for the appearance of disturbances which bear an accidental character. However practically it is hardly advisable (unless reality presses) from the very beginning to abstract from the accidental character of real social-economic processes, specifically from errors in observation, measurement and forecast. An increase in the requirements placed in this instance on the volume of information is compensated by the fact that the formulation itself of the problem of forecasting becomes more natural and corresponding to the character and tasks of social-economic forecasting. Forecasting, for example, of rates of growth in the volumes of production only according to fairly well known closeness of interplays

between different cycles of production is a more natural approach in comparison with direct "expert" determination of future rates of growth.

It is necessary, however, to note that probability forecasting is limited with time. One ought not to confer very great value to a parameter which is located far "in front," inasmuch as in an accelerative system, such as a social-economic system, there will be sufficient time to select an appropriate reaction. Therefore from this viewpoint determination of perspectives with a priori estimation of a duration of 20-30 years should have the greatest value. Moreover, the ability to forecast the distant future, as a rule, has not been very accurate, and today there are no insufficiently effective methods of long-term forecasting. It is necessary in this case to note the curbing influence on duration of forecast from the side of the length of empirical time series.

Inasmuch as economic forecasting is carried out on the basis of analysis and generalization of basic trends of development of the people's economy during rather long periods of time in the past, so within the limits of formalized premises it unavoidably incorporates mathematical-statistical methods of treatment time series.[1]

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[1]Time series themselves of indices are interpreted as a sample from basic stochastic processes which generate these series, the features of which are subject to definition (specifically for forecasting) according to the estimator of the time series. For analysis of social-economic time series one can incorporate the correlation theory of stochastic processes, especially the spectral theory and methods of weighted regression.

However, one should note that existing methods widely used in technology, physics and cybernetics for statistical forecasting, which can be drawn upon for economic forecasting, are somewhat limited. Therefore, in our view, one should not consider their utilization in social-economic forecasting as a "cure for all ills," for by no means do they solve all problems connected with predicting social development. For example, one of the essential limitations in a strictly scientific approach to the problem of forecasting is the fact that the duration of the period of the forecast should not exceed the duration of "prehistory." This means that if the available information about the past period encompasses a 20-year period, then accurately one can forecast not more than 7-10 years. Consequently, the forecast for longer periods unavoidably will incorporate "qualitative" considerations, expert estimates of a different kind, i.e., informal methods, the dependability of which is governed by the validity of the qualitative analysis.

* * *

Long-range planning of the development of all sides of vital activity of socialist society requires a thorough analysis of trends of development of different branches of economics, science, technology, culture, social relations, etc., the basis of which provides a deep development of plans that provide a proportional and most effective development of a social-economic system. Such a kind of forecasting amount finally to basic elements of complete forecasts of the whole people's economy, which determine their expression in long-range plans of social-economic development

of society. Therefore it is entirely valid to examine scientific-technical forecasts as specific subsystems in a wider system of forecasts of social and economic forecasting.

The order of planning accepted today in our country presumes the creation of basic directions of development of science and technology on the basis of forecasting of forthcoming developments of the most central trends of scientific-technical advancement which are harnessed after their affirmation as the basis of long-term plans of development of the people's economy. To investigate basic trends of scientific-technical advancement to the nearest five-year period it is necessary to guarantee a deep development of alternative of scientific-technical forecasts for the most central branches of the people's economy.

All this gives rise to the necessity of attracting to forecasting a large number of the best specialists, the development of the scientifically proven methodology of forecasting, and also theoretical development of problems of forecasting as complex problems of the future development of socialist society.

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13. ABSTRACT

The need for forecasting of social-economic development to substantiate social, economic, and scientific planning is discussed. The need for informal versus formal planning is mentioned, the stress being placed on the latter.

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